Carl Lewis Jump:

$\Delta x = 8.91\ m$

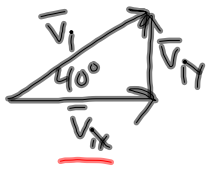
$t = 0.8\ s$ (estimation)

initial angle $= 40°$ (estimation)

Find V_i, Δy (max. height)

$$\Delta x = V_{ix} t$$

$$V_{ix} = \frac{\Delta x}{t} = \frac{8.91\ m}{0.8\ s} = 11.14\ m/s$$



$$\cos(40°) = \frac{V_{ix}}{V_i}$$

$$V_i = \frac{V_{ix}}{\cos(40°)}$$

$$= 14.54\ m/s$$

* estimation of 40° might be a little high... 30° (or less) would be more reasonable.

$$\Delta y = V_{iy} t + \frac{1}{2} a_g t^2 \qquad a_g = -9.8\ m/s^2$$

$V_{iy} = 9.35\ m/s$ (from above triangle)

$= (9.35\ m/s)(.4\ s) +$

$\frac{1}{2}(-9.8\ m/s^2)(.4\ s)^2$

$= 2.9\ m$

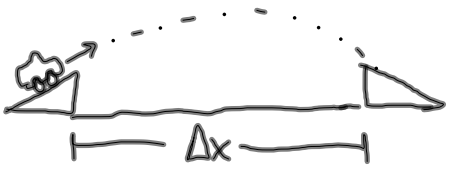
* must use $t = 0.4$ s b/c highest point occurs at half total time

$t = 2.0\,s$

$\Delta x = 269\,ft = 82\,m$

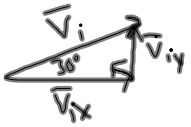
angle $= 30°$ (estimation)

Find v_i, max. height, $\bar{v}_f$ (mag., angle, direction)



$$v_{ix} = \frac{\Delta x}{t} = 41\ m/s$$

find v_i with a triangle:



$$v_i = \frac{v_{ix}}{\cos(30°)} = 47.34\ m/s$$

(~107 mph)

find max. height: * at max height, $v_{fy} = 0\ m/s$

$$v_{fy}^2 = v_{iy}^2 + 2a_g\Delta y$$

$$\Delta y = \frac{-v_{iy}^2}{2a_g}$$

Use triangle above to find $\bar{v}_{iy}$

$v_{iy} = 23.67\ m/s$

$$= \frac{-(23.67\ m/s)^2}{2(-9.8\ m/s^2)}$$

$$= 18.8\ m$$

if he lands at same height he took off, $\Delta y = 0\ m$

find $\bar{v}_f$:

$$v_{fy}^2 = v_{iy}^2 + 2a_g\Delta y$$

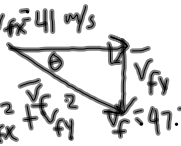
$$v_{fy} = \pm\sqrt{v_{iy}^2}$$

$$= -23.67\ m/s$$

* choose negative because it is coming down

$\bar{v}_{fx} = \bar{v}_{ix}$

$v_{fx} = 41\ m/s$



$v_f^2 = v_{fx}^2 + v_{fy}^2$ $\quad v_f = 47.34\ m/s$

$\theta = \tan^{-1}\left(\frac{v_{fy}}{v_{fx}}\right) = 30°$